

1 **What is claimed is:**
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3 1. A data transfer driver for a data storage device including recording media
4 having one or more recording surfaces, one or more data transducer heads positionable
5 relative to the recording surfaces by a head position actuator structure operating within a
6 head position servo loop, the data transfer driver comprising:
7

8 one or more head interfaces, each head interface electrically connected to a
9 transducer head for controlling the transducer head for data read and/or write operations;
10 a mode controller electrically connected to each head interface, for controlling
11 the operation of each head interface for selectively reading data from at least one recording
12 surface via at least one transducer head while writing data to at least one recording surface
13 via at least one transducer head.

14 2. The data transfer driver of claim 1 wherein the mode controller further controls
15 the operation of each head interface for selectively writing data to at least one recording
16 surface via at least one transducer head, and/or reading data from at least one recording
17 surface via at least one transducer head.

18 3. The data transfer driver of claim 1 wherein the mode controller controls the
19 operation of the head interfaces based on configuration information, wherein the
20 configuration information includes data transfer mode and transducer head selection
21 information.
22

23 4. The data transfer driver of claim 3 wherein the configuration information
24 includes:
25

26 read mode, wherein the mode controller controls the operation of the head
27 interfaces for selectively reading data via at least one transducer head;
28 write mode, wherein the mode controller controls the operation of the head
29 interfaces for selectively writing data via at least one transducer head;
30 servowrite mode, wherein the mode controller controls the operation of the

1 head interfaces to selectively writing data via a plurality of transducer heads; and
2 read-write-write (RWW) mode, wherein the mode controller controls the
3 operation of the head interfaces for selectively reading data from at least one recording
4 surface via at least one transducer head while writing data to at least one recording surface
5 via at least one transducer head.

6
7 5. The data transfer driver of claim 1 further comprising a control interface
8 connected to the mode controller, the control interface for receiving configuration information
9 wherein the mode controller controls the operation of the head interfaces based on the
10 configuration information.

11
12 6. The data transfer driver of claim 1 wherein each head interface comprises:
13 a read circuit for controlling the corresponding transducer head to read data
14 from a recording surface, and
15 a write circuit for controlling the corresponding transducer head to write data
16 to a recording surface.

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18 7. The data transfer driver of claim 1 wherein the data storage device includes a
19 plurality of data transducer heads, the data transfer driver further comprising a plurality of
20 head interfaces corresponding to the data transducer heads, each head interface being
21 electrically connected to a corresponding transducer head for controlling that transducer
22 head for data read and/or write operations; and

23 wherein the mode controller is further electrically connected to the plurality of
24 the head interfaces, for controlling the operation of the head interfaces based on
25 configuration information for selectively: (i) writing data to one or more recording surfaces,
26 (ii) reading data from at least one recording surface the data disk, and/or (iii) reading data
27 from at least one recording surface while writing data to one or more recording surfaces.

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29 8. The data transfer driver of claim 7 wherein the configuration information
30 includes transducer head selection and data transfer mode information.

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2 9. The data transfer driver of claim 7 wherein each head interface comprises:
3 a read circuit for controlling the corresponding transducer head to read data
4 from the data disk, and
5 a write circuit for controlling the corresponding transducer head to write data
6 to the data disk.

7
8 10. The data transfer driver of claim 7 wherein the mode controller controls the
9 operation of the head interfaces based on the configuration information for writing data to a
10 recording surface via a transducer head while reading data from the recording surface via
11 that same transducer head.

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13 11. The data transfer driver of claim 7 wherein the mode controller controls the
14 operation of the head interfaces based on the configuration information for writing data to at
15 least one recording surface via at least one transducer head while reading data from at least
16 one recording surface via at least another transducer head.

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18 12. The data transfer driver of claim 1, wherein the data storage device comprises
19 a disk drive and the recording media comprises one or more magnetic data disks.

20
21 13. A method for self-servo writing a disk drive comprising the steps of:
22 (a) transferring a reference pattern onto at least one recording surface of a
23 reference disk, wherein the transferred reference pattern comprises servo clock information
24 providing transducer head circumferential relative position information, and servo position
25 information providing transducer head radial relative position information;
26 (b) assembling the disk drive including the steps of installing the reference
27 disk and one or more other data disks into the disk drive and enclosing the disks and data
28 transducers within a housing, each data disk including at least one recording surface; and
29 (c) reading the transferred reference pattern from the reference disk via a
30 transducer head and using the read servo clock and the servo position information to

1 position and maintain one or more transducer heads on one or more said data disk
2 recording surfaces while writing final servo patterns onto said one or more data disk
3 recording surfaces.

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5 14. The method of claim 13, wherein step (c) further comprises the steps of
6 generating the final servo patterns for writing to the disk surfaces.

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8 15. The method of claim 13 further comprising the steps of:
9 including a preamplifier in the disk drive for selectively reading data from at
10 least one recording surface using at least transducer head while selectively writing data to
11 one or more recording surfaces using one or more transducer heads.

12

13 16. The method of claim 15 wherein step (c) further comprises the steps of:
14 using the preamplifier for reading the transferred reference pattern from the
15 reference disk via a transducer head while writing final servo patterns onto said one or more
16 data disk recording surfaces using one or more transducer heads.

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18 17. The method of claim 16 further comprising the steps of:
19 including a drive controller in the disk drive to control the preamplifier for
20 selectively reading the reference pattern from the reference disk via a transducer head and
21 using the read servo clock and the servo position information to position and maintain one or
22 more transducer heads on one or more said data disk recording surfaces, while writing final
23 servo patterns onto said one or more data disk recording surfaces.

24

25 18. The method of claim 15 wherein the preamplifier comprises:
26 a control interface for receiving configuration information to selectively transfer
27 data to and/or from at least a recording surface;
28 a head interface for each transducer head wherein each head interface is
29 electrically connected to a corresponding transducer head for controlling the transducer
30 head for data read and/or write operations; and

1 a mode controller electrically connected to the control interface and to the
2 head interface, for controlling the operation of the head interfaces based on the configuration
3 information for selectively: (i) reading data from at least a recording surface using at least a
4 transducer head, (ii) writing data to at least recording surface using at least a transducer
5 head, and/or (iii) writing data to a recording surface using at least a transducer head while
6 reading data from a recording surface using at least a transducer head.

7

8 19. The method of claim 16 wherein the configuration information includes data
9 transfer mode, and transducer head selection information.

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11 20. The method of claim 17 wherein the configuration information includes:
12 read mode, wherein the mode controller controls the operation of the head
13 interfaces for selectively reading data via at least one transducer head;
14 write mode, wherein the mode controller controls the operation of the head
15 interfaces for selectively writing data via at least one transducer head;
16 servowrite mode, wherein the mode controller controls the operation of the
17 head interfaces to selectively writing data via a plurality of transducer heads; and
18 read-while-write (RWW) mode, wherein the mode controller controls the operation of
19 the head interfaces for selectively reading data from at least one recording surface via at
20 least one transducer head while writing data to at least one recording surface via at least
21 one transducer head.

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23 21. The method of claim 16 wherein each head interface comprises:
24 a read circuit for controlling the corresponding transducer head to read data
25 from a recording surface, and
26 a write circuit for controlling the corresponding transducer head to write data
27 to a recording surface.

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29 22. The method of claim 16 wherein the mode controller controls the operation of
30 the head interfaces based on the configuration information for writing data to a recording

1 surface via at least one transducer head while reading data from that recording surface that
2 same transducer head.

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4 23. In a disk drive including one or more data disks having recording surfaces,
5 one or more transducers, a reference disk having a reference pattern on a recording surface
6 thereof, the reference pattern comprising servo clock information providing transducer head
7 circumferential relative position information, wherein the heads are positionable relative to
8 the recording surfaces by a head position actuator structure operating within a head position
9 servo loop, a method for self-servo writing including the steps of:

10 reading the transferred reference pattern from the reference disk via a
11 transducer head and using the read servo clock and the servo position information to
12 position and maintain one or more transducer heads on one or more said data disk
13 recording surfaces while writing final servo patterns onto said one or more data disk
14 recording surfaces.

15

16 24. The method of claim 23 wherein the disk drive further includes a preamplifier
17 in the disk drive for selectively reading data from at least one recording surface using at least
18 one transducer head while selectively writing data to one or more recording surfaces using one
19 or more transducer heads, the method further comprising the steps of using the preamplifier
20 for reading the reference pattern from the reference disk via a transducer head while writing
21 final servo patterns onto said one or more data disk recording surfaces using one or more
22 transducer heads.

23

24 25. The method of claim 24 further comprising the steps of:
25 using the read servo clock and the servo position information to position and
26 maintain one or more transducer heads on one or more said data disk recording surfaces,
27 while writing final servo patterns onto said one or more data disk recording surfaces.

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29 26. The method of claim 25 wherein the preamplifier comprises:
30 a control interface for receiving configuration information to selectively transfer

1 data to and/or from at least a recording surface;
2 a head interface for each transducer head wherein each head interface is
3 electrically connected to a corresponding transducer head for controlling the transducer
4 head for data read and/or write operations; and
5 a mode controller electrically connected to the control interface and to the
6 head interface, for controlling the operation of the head interfaces based on the configuration
7 information for selectively: (i) reading data from at least a recording surface using at least a
8 transducer head, (ii) writing data to at least recording surface using at least a transducer
9 head, and/or (iii) writing data to a recording surface using at least a transducer head while
10 reading data from a recording surface using at least a transducer head.

11

12 27. The method of claim 26 wherein the configuration information includes data
13 transfer mode, and transducer head selection information.

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15 28. The method of claim 27 wherein the configuration information includes:
16 read mode, wherein the mode controller controls the operation of the head
17 interfaces for selectively reading data via at least one transducer head;
18 write mode, wherein the mode controller controls the operation of the head
19 interfaces for selectively writing data via at least one transducer head;
20 servowrite mode, wherein the mode controller controls the operation of the
21 head interfaces to selectively writing data via a plurality of transducer heads; and
22 read-while-write (RWW) mode, wherein the mode controller controls the operation of
23 the head interfaces for selectively reading data from at least one recording surface via at
24 least one transducer head while writing data to at least one recording surface via at least
25 one transducer head.

26

27 29. The method of claim 26 wherein each head interface comprises:
28 a read circuit for controlling the corresponding transducer head to read data
29 from a recording surface, and
30 a write circuit for controlling the corresponding transducer head to write data

1 to a recording surface.

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3 30. A disk drive comprising:

4 recording media having one or more recording surfaces,

5 one or more data transducer heads,

6 a head position actuator structure for positioning the heads relative to the

7 recording surfaces, operating within a head position servo loop;

8 a preamplifier comprising:

9 one or more head interfaces, each head interface electrically

10 connected to a transducer head for controlling the transducer head for data read and/or write

11 operations;

12 a mode controller electrically connected to each head interface and

13 responsive to the servo controller, for controlling the operation of each head interface based

14 on configuration information for selectively reading data from at least one recording surface

15 via at least one transducer head while writing data to at least one recording surface via at

16 least one transducer head; and

17 a drive controller configured for controlling the head position actuator structure

18 to position the heads relative to the recording surfaces, and for providing the configuration

19 information to the preamplifier for selectively reading data from at least one recording

20 surface via at least one transducer head while writing data to at least one recording surface

21 via at least one transducer head.

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23 31. The disk drive of claim 30 wherein the mode controller further controls the

24 operation of each head interface for selectively: writing data to at least one recording surface

25 via at least one transducer head, and/or reading data from at least one recording surface via

26 at least one transducer head.

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28 32. The disk drive of claim 30 wherein the configuration information includes data

29 transfer mode and transducer head selection information.

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1 33. The disk drive of claim 32 wherein the configuration information includes:
2 read mode, wherein the mode controller controls the operation of the head
3 interfaces for selectively reading data via at least one transducer head;
4 write mode, wherein the mode controller controls the operation of the head
5 interfaces for selectively writing data via at least one transducer head;
6 servowrite mode, wherein the mode controller controls the operation of the
7 head interfaces to selectively writing data via a plurality of transducer heads; and
8 read-while-write (RWW) mode, wherein the mode controller controls the
9 operation of the head interfaces for selectively reading data from at least one recording
10 surface via at least one transducer head while writing data to at least one recording surface
11 via at least one transducer head.

12
13 34. The disk drive of claim 30 wherein the preamplifier further comprises a control
14 interface connected to the mode controller, the control interface for receiving configuration
15 information from the drive controller wherein the mode controller controls the operation of the
16 head interfaces based on the configuration information.

17
18 35. The disk drive of claim 30 wherein each head interface comprises:
19 a read circuit for controlling the corresponding transducer head to read data
20 from a recording surface, and
21 a write circuit for controlling the corresponding transducer head to write data
22 to a recording surface.

23
24 36. The disk drive of claim 30, wherein the mode controller controls the operation
25 of the head interfaces based on the configuration information for writing data to a recording
26 surface via a transducer head while reading data from the recording surface via that same
27 transducer head.

28
29 37. The disk drive of claim 30, wherein the recording media includes one or more
30 data disks having recording surfaces, the disk drive further including a reference disk having

1 a reference pattern thereon, wherein the transferred reference pattern comprises servo clock
2 information providing transducer head circumferential relative position information, and servo
3 position information providing transducer head radial relative position information;
4 wherein the drive controller is further configured for controlling the actuator
5 and the preamplifier in a servo control loop, for reading the reference pattern from the
6 reference disk via a transducer head and using the read servo clock and the servo position
7 information to position and maintain one or more transducer heads on one or more said data
8 disk recording surfaces while writing final servo patterns onto said one or more data disk
9 recording surfaces.

10
11 38. The disk drive of claim 37, wherein the drive controller controls the actuator
12 and the preamplifier for:

13 reading the reference pattern from the reference disk via a transducer head
14 and using the read servo clock and the servo position information to position and maintain
15 one or more transducer heads on one or more said data disk recording surfaces;
16 while at the same time generating and writing final servo patterns onto said
17 one or more data disk recording surfaces.

18
19 39. The disk drive of claim 37, wherein the drive controller further comprises:
20 a pattern generator for generating the final servo patterns for writing to the
21 recording surfaces; and

22 a servo controller for controlling the actuator and the preamplifier in a servo
23 control loop, for reading the reference pattern from the reference disk via a transducer head
24 and using the read servo clock and the servo position information to position and maintain
25 one or more transducer heads on one or more said data disk recording surfaces while
26 writing the final servo patterns onto said one or more data disk recording surfaces.